

REMARKS

Upon entry of this Amendment, claims 6-26 remain pending, with claims 6-10, and 21-26 under current examination, and claims 11-20 withdrawn from consideration as drawn to a nonelected invention.

In the Office Action,¹ the Examiner rejected claims 6-10 under 35 U.S.C. § 103(a) as being unpatentable over Gotoh et al. (U.S. Patent No. 5,650,041) (“Gotoh”) in view of Chapman (U.S. Patent No. 5,976,769) (“Chapman”) and Ha (U.S. Patent No. 6,117,715) (“Ha”).

Applicants traverse the rejection for the reasons that follow.

Rejection of Claims 6-10 under 35 U.S.C. § 103(a):

Applicants respectfully traverse the rejection of 6-10 under 35 U.S.C. § 103(a) as being unpatentable over Gotoh in view of Chapman and Ha. Applicants respectfully disagree with the Examiner’s arguments and conclusions. No *prima facie* case of obviousness has been established. As M.P.E.P. § 2142 states, “[t]he examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness.”

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant’s disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). M.P.E.P. § 2142, 8th Ed., Rev. 4 (October 2005), p. 2100-134.

Each of these requirements must “be found in the prior art, and not be based on applicant’s disclosure.” M.P.E.P. § 2143. A requirement for establishing a *prima facie* case of

¹ The Office Action may contain statements characterizing the related art, case law, and claims. Regardless of whether any such statements are specifically identified herein, Applicants decline to automatically subscribe to any statements in the Office Action.

obviousness is not met, because Gotoh, Chapman and Ha, taken alone or in combination, do not teach or suggest every feature of Applicants' claims.

In the Office Action, the Examiner admits that Gotoh

fails to disclose the steps of

forming a mask layer on the first mask pattern such that an exposed portion of the soluble thin film is covered with the mask layer;

etching back the mask layer such that an upper face of the first mask pattern is exposed and the portion of the mask layer covering the exposed portion of the soluble thin film remains to form a second mask pattern;

removing the first mask pattern;

etching the soluble thin film and the film to be processed using the second mask pattern as a mask. Office Action, p. 3.

The Examiner also admits that Gotoh "fails to disclose a step wherein dissolving the etched soluble thin film in the dissolving liquid, thereby lifting off the second mask pattern from the film to be processed" (Office Action, p. 2).

The Examiner applied Ha in an attempt to cure the deficiencies of Gotoh. Ha, however, does not teach or suggest "forming a soluble thin film," according to Applicants' independent claim 6. The Examiner cites first silicon dioxide layer 305 as constituting the claimed soluble thin film. *See* Office Action, p. 3. Instead, Ha teaches a buffer oxide layer 303 formed on the face of integrated circuit substrate 301, with a first silicon nitride layer 304 formed on buffer oxide layer 303, and a first silicon dioxide layer 305 formed on silicon nitride layer 304. *See* Ha, Fig. 3(b) and col. 4, ll. 12-20. Even though Ha teaches that the first silicon nitride layer and the first silicon oxide layer have an etching selectivity relative to one another (col. 4, lines 21-23), this does not constitute the claimed "forming a soluble thin film" (claim 6).

Moreover, because Ha does not teach "forming a soluble thin film" (claim 6), Ha also cannot teach the remaining elements of claim 6 that recite additional processing steps performed

on the soluble thin film. That is, Ha also does not teach “forming a mask layer on the first mask pattern such that an exposed portion of the soluble thin film is covered with the mask layer,” “etching back the mask layer such that an upper face on the first mask pattern is exposed and the portion of the mask layer covering the exposed portion of the soluble thin film remains to form a second mask pattern,” and “etching the soluble thin film and the film to be processed using the second mask pattern as a mask,” also recited in claim 6.

To allegedly cure Gotoh’s deficiencies in that Gotoh “fails to disclose a step wherein dissolving the etched soluble thin film in the dissolving liquid, thereby lifting off the second mask pattern from the film to be processed” (Office Action, p. 2), the Examiner applied Chapman. The teachings of Chapman, however, cannot be incorporated into Gotoh to teach or suggest the claimed “dissolving the etched soluble thin film in a dissolving liquid, thereby lifting off the second mask pattern from the film to be processed” (claim 6). Chapman describes a process that uses an intermediate layer as “a liftoff to remove the overlying photoresist or photoresist residue.” Chapman, col. 6, ll. 12-15. The process utilizes a solution to dissolve Chapman’s intermediate layers 917 and 918, allowing photoresist 911 and 912, along with hardened photoresist portions 913 and 914, to separate from polysilicon 906. *See Chapman*, Figs. 9(a) to 9(c); col. 6, ll. 29-32.

Gotoh, in contrast, describes a problem concerning a “polymer residue layer.” Gotoh, col. 1, ll. 25-63. The polymer residue layer 9, shown in Gotoh, Fig. 2(e), covers the sidewalls of holes 2a, 4a, and 5a formed in BPSG layer 2, lower resist mask 4, and intermediate mask layer 5, respectively. *See Gotoh*, col. 4, ll. 38-40. Lower resist mask layer 4 and intermediate mask layer 5 are removed using a dry etching process using etching gas 8. *See Gotoh*, col. 4, ll. 27-47;

Figs. 2(a)-2(f). Polymer residue layer 9 is then removed via a cleaning treatment utilizing a hydrogen fluoride solution. *See Gotoh*, col. 4, ll. 48-50; col. 5, ll. 20-26.

Assuming that polymer residue layer 9 in Gotoh corresponds to the hardened photoresist portions 913 and 914 in Chapman, hardened photoresist portions 913 and 914 in Chapman cannot be dissolved in the solution used in the liftoff process, and polymer residue layer 9 also cannot be dissolved in the solution. Thus, if the dissolving solution is applied to the structure described in Gotoh, polymer residue layer 9 prevents lower resist mask layer 4 from being dissolved, making it impossible for intermediate mask layer 5 to be lifted off as required by the claimed “dissolving the etched soluble thin film in a dissolving liquid, thereby lifting off the second mask pattern from the film to be processed” (claim 6). Therefore, it is not possible to incorporate the teachings of Chapman into the method of Gotoh to teach or suggest at least this element of claim 6.

Assuming, solely for the sake of argument, that the combination of Gotoh and Chapman is proper, there is no motivation to combine these references with Ha. Ha teaches traditional photolithography (Ha, col. 4, ll. 33-36), forming gate electrodes prior to the cleaning step (Ha, col. 5, ll. 15-22), and the removal of the second mask pattern (Ha, col. 5, ll. 26-28), which is inconsistent with Chapman’s teachings of dissolving a sacrificial layer (*See Chapman*, Abstract, and col. 6, ll. 29-32). Thus, the Examiner has not established the requisite motivation necessary to combine Gotoh, Chapman, and Ha, from within the references themselves.

The Federal Circuit has noted that “virtually all [inventions] are combinations of old elements.” *See e.g., In re Rouffet*, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457 (Fed. Cir. 1998) (internal citations omitted). The Federal Circuit has explained that an examiner may find every element of a claimed invention in the prior art, but mere identification is not sufficient to negate

patentability. *See id.* The court explained that “the examiner must show reasons that the skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references for combination in the manner claimed.” *Id.*

The desire to combine or modify the references must be proved with “substantial evidence” that is a result of a “thorough and searching” factual inquiry. *See In re Lee*, 277 F.3d 1338, 1343-1344 (Fed. Cir. 2002), 61 USPQ2d 1430, 1433 (quoting *McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339, 1351-52). Also, the Federal Circuit has clearly stated that the evidence of a motivation or suggestion to modify a reference must be “clear and particular.” *In re Dembicziak*, 175 F.3d 994, 999, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999).

In this case, the Examiner does not show that a skilled artisan, considering Gotoh, Chapman, and Ha, and not having the benefit of Applicants’ disclosure, would have been motivated to combine the references in a manner resulting in Applicants’ claimed combination. The Examiner merely provided descriptions of how the references allegedly teach certain features without providing “clear and particular” reasons why a skilled artisan “would select the elements from the cited prior art references for combination in the manner claimed.” *See In re Dembicziak*, 175 F.3d at 999, 50 USPQ2d at 1617; *In re Rouffet*, 149 F.3d at 1357, 47 USPQ2d at 1457.

In addition to the reasoning presented above, Applicants submit that Gotoh does not teach or suggest at least Applicants’ claimed “forming a soluble thin film containing at least one compound selected from the group consisting of tungsten oxide, aluminum oxide, titanium oxide, and titanium nitride on a film to be processed, the film to be processed being formed on a semiconductor substrate” (claim 6). Instead, Gotoh’s lower resist layer 4 is applied on top of

the silicate glass doped with boron and phosphorus (BPSG layer 2) that serves as the “film to be processed.” *See Gotoh*, col. 4, ll. 5-10, and Figs. 2(a)-2(e). *Gotoh* then states that lower resist layer 4 is made of Novolak resin, making no mention of the claimed “forming a soluble thin film containing at least one compound selected from the group consisting of tungsten oxide, aluminum oxide, titanium oxide, and titanium nitride on a film to be processed, the film to be processed being formed on a semiconductor substrate” (claim 6). Moreover, *Gotoh* also fails to teach or suggest the claimed “forming a first mask pattern on the soluble thin film” (claim 6), for the reasons just presented. Therefore, *Gotoh* does not teach or suggest at least these additional elements of claim 6.

For at least these reasons, no *prima facie* case of obviousness of amended independent claim 6 has been established. Independent claim 6 is therefore allowable (as is independent claim 7, in which elements of claim 6 have been included), and dependent claims 8-10 are also allowable at least by virtue of their respective dependence from claim 6. Therefore, Applicants request that the improper 35 U.S.C. § 103(a) rejection be withdrawn.

New Claims 21-26:

Applicants have amended claims 6, 7, 9, and 10 to more appropriately define the present invention, and added new claims 21-26 to protect additional aspects related to the present invention. Support for the amendments to claims 6, 7, 9, and 10 is present in the application as originally filed. Support for new claims 21-26 may be found in the specification at, for example, Figure 3 and the corresponding description at page 10, lines 3-19 and page 15, lines 23-27.

New claim 21, as well as dependent claims 22-26, are distinguishable from *Gotoh* in part because lower resist mask 4 and intermediate mask layer 5 in *Gotoh* are removed by dry etching using etching gas 8. *See Gotoh*, col. 4, ll. 27-47; Figs. 2(a)-2(f). *Gotoh* thus fails to teach or

suggest at least the claimed “forming a soluble thin film to be dissolved in a dissolving liquid on a film to be processed, the film to be processed being formed on a semiconductor substrate,” as required by claim 21. For at least this reason, Gotoh also fails to teach or suggest “forming a first mask pattern on the soluble thin film” (claim 21).

In addition, for the same reasons as discussed above, it is impossible to incorporate the teachings of Chapman into the method of Gotoh to teach or suggest the claimed “dissolving the etched soluble thin film in the dissolving liquid, thereby lifting off the second mask pattern from the film to be processed” (claim 21).

For at least these reasons, Applicants request that new claims 21-26 be allowed.

Conclusion:

In view of the foregoing, Applicants respectfully request reconsideration of the Application and withdrawal of the rejection. Because Applicants’ amendments and arguments have removed all of the pending rejections, pending claims 6-10 and 21-26 are in condition for allowance, and Applicants request a favorable action.

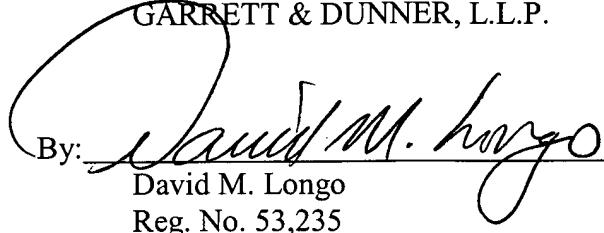
If there are any remaining issues or misunderstandings, Applicants request the Examiner telephone the undersigned representative to discuss them.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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